

Degenerative Myelopathy in German Shepherd Dogs

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The Disease:

Degenerative Myelopathy (DM) was first described as a specific degenerative neurologic disease in 1973. Since then, much has been done to understand the processes involved in the disease and into the treatment of DM. Hopefully, this will help you understand the problem and to explain further the steps that can be taken to help dogs afflicted with DM.

The age at onset is 5 to 14 years, which corresponds to the third to sixth decades of human life. Although a few cases have been reported in other large breeds of dogs, the disease appears with relative frequency only in the German Shepherd breed, suggesting that there is a genetic predisposition for German Shepherd dogs (GSD) in developing DM. The work presented here and by others on the nature of DM has been performed in the German Shepherd breed. Care must be taken in extrapolating this information to other breeds of dogs. It is currently not known whether the exact condition exists in other breeds of dogs. Many dogs may experience a spinal cord disease (myelopathy) which is chronic and progressive (degenerative); but, unless they are caused by the same immune-related disease which characterizes DM of GSD, the treatments described herein may be ineffectual. The breeds for which there is data to suggest that they also suffer from DM of GSD are the Belgium Shepherd, Old English Sheep Dog, Rhodesian Ridgeback, Weimaraner and, probably, Great Pyrenees. Confirmation of the diagnosis is important in other breeds before assuming that they have DM of GSD.

Diagnosis of DM is made by a history of progressive spinal ataxia and weakness that may have a waxing and waning course or be steadily progressive. This is supported by the neurologic findings of a diffuse thoracolumbar spinal cord dysfunction. Clinical pathologic examinations are generally normal except for an elevated cerebral spinal fluid (CSF) protein in the lumbar cistern. Electromyographic (EMG) examination reveals no lower motor unit disease, supporting the localization of the disease process in the white matter pathways of the spinal cord. Spinal cord evoked potentials recorded during the EMG do show changes which help determine the presence of spinal cord disease. Radiographs of the spinal column including myelography are normal (other than old age changes) in uncomplicated DM. Unfortunately, myelography can be associated with worsening of clinical signs and carries some degree of risk for certain patients.

Dogs afflicted with DM have depressed lymphocyte blastogenesis to plant mitogens. The depression of their cell mediated immune responses correlates with the clinical stage and severity of the disease. Furthermore, this suppression has been shown to be due to the

genesis of a circulating suppressor cell. Some dogs with DM exhibit antigen-binding cells specific to canine myelin basic protein. Immunoglobulins have been shown to be bound within lesions within the spinal cords of dogs with DM. These patients also show increased circulating immune-complexes in their sera. The antigens in these immune-complexes have been examined and appear to be markers of inflammation as they have been found to exist in patients who have other inflammatory diseases of the central nervous system. 2-Dimensional electrophoresis of CSF proteins indicates that the elevated proteins in the CSF of DM patients represent changes which are related to inflammation. While these changes are not specific for DM, the other conditions in which the inflammatory proteins have been found in CSF can be differentiated by clinical signs. The 2-dimensional electrophoresis of CSF proteins appears to be one of the most specific change seen in DM. Recently, we have found that CSF levels of the enzyme, acetylcholinesterase, are elevated in patients with DM. Again, this occurs in other forms of central nervous system inflammation in dogs. However, when combined with the history, neurologic signs, CSF protein concentration and EMG, the elevated CSF acetylcholinesterase level helps confirm the diagnosis. This allows the inclusion of DM in the diagnosis, even if other problems are uncovered during the examination.

The gross pathologic examination of dogs with DM generally is not contributory toward the diagnosis. The striking features being the reduction of rear limb and caudal axial musculature. The microscopic neural tissue lesions consist of widespread demyelination of the spinal cord, with the greatest concentration of lesions in the thoracolumbar spinal cord region. In severely involved areas, there is also a reduced number of axons, an increased number of astroglial cells and an increased density of small vascular elements. In the thoracic spinal cord, nearly all funiculi are vacuolated. Similar lesions are occasionally seen scattered throughout the white matter of the brains from some dogs, as well. Many patients have evidence of plasma cell infiltrates in the kidneys on throughout the gastrointestinal tract, providing a hint to the underlying immune disorder causing DM.

During the past two decades, we, at the University of Florida, have provided important new insights into the pathoetiology of DM. The release of antigens during the disease process could explain the immune deficits seen in DM and suggests that processing these immune-complexes by circulating macrophages leads to the development of the circulating suppressor cells that were previously noted. This provides a logical explanation for the presence of immune abnormalities in GSD with DM. Electrophoresis of immune-complexes demonstrates that the proteins present are inflammatory proteins which increase in inflammatory diseases of the dog nervous system. It is hoped that working with the antigens present in the immune-complexes will lead to a major breakthrough in our understanding of DM and that this also could lead to an early serodiagnostic test for the condition. However, the development of a serodiagnostic test will await the availability of antibodies specific to unique markers within the inflammatory proteins of DM dog immune-complexes.

While the cause of the altered immune system is not known, what is increasingly clear is that DM is caused by an autoimmune disease attacking the nervous systems of patients,

leading to progressive neural tissue damage. In many respects, DM is similar to what has been discovered about the pathogenesis of Multiple Sclerosis in human beings. In fact, based upon new data concerning the pathology of MS, we can now say with some degree of certainty that DM is MS in dogs. We believe that, due to some triggering factor, immune-complexes circulate. These immune-complexes lead to endothelial cell damage in the vessels of the CNS. Subsequently, fibrin is deposited in the perivascular spaces. When this degrades (point of action of aminocaproic acid), inflammatory cells are stimulated to migrate into the lesions. The inflammatory cells release prostaglandins and cytokines (point of action of vitamin E and C) which leads to the activation of tissue enzymes and the formation of oxygen free-radicals (point of action of acetylcysteine) which, in turn, leads to tissue damage. Treatment of DM of GSD, which we recommend, is directed at these pathologic processes.

The Integrative Medical Approach to Treatment of Degenerative Myelopathy:

The treatment of DM involves four basic approaches:

- 1) exercise
- 2) dietary supplementation
- 3) medication
- 4) other supportive measures

Rationale:

Degenerative Myelopathy is an autoimmune disease whereby the patient's own immune system attacks their central nervous system. This immune attack leads to loss of myelin (insulation around nerve fibers) and axons (nerve fibers). While it begins and is most severe within the thoracolumbar (middle back) spinal cord, DM also affects other areas of the central nervous system including the brain stem and sub-cortical white matter. The cause of this autoimmune disease is not known, but there are probably genetic, environmental and toxic factors which eventually lead to its development. Conventional medicine has little to offer patients with DM. On the other hand, use of exercise, certain vitamins and selected drugs have delayed or prevented progression of DM in many afflicted dogs. While these treatment modalities have been directed at suppression of the clinical signs, little has been done to prevent the development of this autoimmune disease.

The purpose of this paper is to provide a rationale for treatment of German Shepherd dogs afflicted with DM with dietary alternatives and certain dietary supplements, hoping to prevent or correct the immune dysfunction which leads to the development of DM.

Most of the suggestions presented here have been extrapolated from the human disease most similar to DM in dogs, Multiple Sclerosis, or its animal model, experimental allergic encephalitis. Additional information about the integrative treatment of MS can be found on Dr. Weil's web page (<http://www.drweil.com>). Dr. Weil teaches integrative medicine at the University of Arizona's Medical School.

Exercise:

The importance of regular aerobic exercise in the prevention of chronic degenerative diseases should not be overlooked. Many studies in human beings have demonstrated improved muscle performance, memory and cerebral blood flow in patients who undertake aerobic exercise. Many of the goals of treatment in DM are obtainable through regular exercise. Two forms of exercise seem the most useful: walking and swimming. Both have their merits and they may not be exclusive. A number of owners have reported that swimming assists dogs beyond the exercise of mere walking. Swimming generally increases muscle tone and allows movement without stress on joints. Walking, on the other hand, helps build strength, since gravity is involved. In older patients, particularly those with arthritis, gradually building the exercise program is important. In addition, allowing a day of rest between heavy workouts can help the patient recover faster from the exercise. A good general reference of exercise physiology and exercise programs is a book by Jeff Galloway: Galloway's Book on Running, Shelter Publications, Inc., Bolinas, CA, 1984.

Exercise is extremely important in maintaining the well being of affected dogs, maximizing muscle tone and maintaining good circulation and conditioning. This is best achieved by an increasing schedule of alternative day exercise. Running loose on the owner's property is not adequate; regular periods of programmed continuous exercise are the most important. It is equally important that the patient with DM be allowed to rest on the day when exercise is not programmed. This will allow strained muscles and tendons to heal and increase the build up of muscle strength. The dogs do not have to be confined, only that they are not encouraged to do strenuous exercise on the "off" day. I recommend starting with 5-10 minutes of walking or swimming every other day for 2 weeks. Then, increase the length of exercise time to a goal of 30 minutes twice a week and a long walk of 1 hour once a week. If your dog already exceeds this limits, that is fine. However, remember to provide a day of easier exercise between vigorous workouts. This is particularly important as the patient gets older. If the patient exhibits muscle or joint stiffness on the day following vigorous exercise, try ginger, garlic, mustard and feverfew to reduce inflammation. Alternately, carprofen (Rimadyl 2 mg/kg twice a day) or acetaminophen (5 mg/kg up to 3 times a day) may help make the patient more comfortable. Many DM patients have remained functional because of exercise alone. We used to think that hospitalization was harmful to patients. We now know it is the lack of exercise which is harmful. Make sure your pet gets their exercise if they are hospitalized or kenneled for any period of time.

Supplementation:

Dietary Considerations:

Dietary and dietary supplement management of DM has not received great attention. We, and others, have long sense recommended certain dietary additives do in part to deficient levels of certain vitamins in dogs afflicted with DM, yet dietary supplementation has not resulted in more than mild reduction in the rate of progression of the clinical signs. On the other hand, diet may have a powerful influence on the development of chronic degenerative diseases and new information suggests that dietary regulation might play a more significant role in the progression and development of diseases like MS. Elimination of toxins from pre-processed food may assist in preventing a number of immune-related disorders. The current treatment of DM is designed to suppress the immune disease, but does nothing to correct the immune alterations which led to the disease state. Diet might help in correcting this defect and allow the immune system in DM dogs to stabilize. The principles of dietary therapy are outlined here, including a "home-made" diet. For those who cannot "cook" for their dog, the basic diet should be supplemented with the additional ingredients list below. It is best to choose a dog food which is close in protein content and is as "natural" as possible. Wild dogs were not meat eaters. They ate bodies, including intestinal contents (often laden with plants and plant materials). Dogs have evolved so that eating animal fats and protein do not cause them to suffer the same problems as human beings when eating these sources of saturated fats. Even so, dogs probably suffer from the same causes of dietary and environmental intoxication which affects human beings.

The basic diet and its components have been checked for balance. In addition to the basic components, we are adding vitamins, minerals and natural herb supplements for which no specific requirement is known or at levels which are to provide a specific pharmacologic effect. Again, we recommend those compounds which scientific evidence supports their efficacy. Used according to the following formula, the diet and compounds should not do any harm and have the potential to do good. By cooking for your dog, you can select healthy products which do not have preservatives and additives which might be harmful. In addition, you have the option to use organically grown foods. If the dietary approach is successful, DM patients may not need to use other medications to prevent further deterioration. It is also possible that this diet might prevent the development of DM in dogs who are presently healthy. These hypotheses will be evident in the future, if they remain true.

Basic diet: (based upon 1 serving size for 30-50 pounds body weight)

2 oz Boneless Pork Center Loin Chop (boiled, baked or fried in olive oil)

4 oz Tofu (soybean curd)

8 oz Long Grain Brown Rice (3 oz cooked in 6 oz water)

2 tsp Extra Virgin Olive Oil

1/4 cup Molasses

2 Whole Carrots (boiled and then cut up)

1 cup Spinach (cooked)

4 Tbs Green Bell Pepper (chopped and steamed)

4 Broccoli Spears (boiled and then cut up)

This diet (1 serving for 30-50 pounds body weight) provides approximately 1160-1460 calories per serving. You can substitute poultry meats, beef and lamb for the pork chop. This will alter the composition slightly, mainly by added additional fat. The weight of meat is based upon boneless weight. Most of the items can be prepared in a microwave. Based upon your dogs body weight, you will need to make more or less. For example, if your dog weighs 80 pounds, multiply all the ingredients by 1.5 (can be as high as 2.5 times, though), keeping their relative proportions. This is a starting point. You can also make this portion of the diet in advance, aliquot it into appropriate quantities and freeze it for later use. Just before feeding time, remove the diet from the freezer and thaw in hot (or boiling) water or microwave to defrost. To complete the diet, add (amount per serving) before serving:

1 tsp Dry Ground Ginger

2 Raw Garlic Cloves (crushed)

½ tsp Dry Mustard

1 tsp Bone Meal

Using the above diet, approximately 1 serving equals 1 can of commercial dog food. The exact requirements for your dog can be approximated by substituting the diet on that basis. You should weigh your dog each week, if losing weight, increase the amount of the diet given. If gaining weight, cut back on the amount given. Eventually, the correct amount will be clear. The reason why the amount has such a broad range in that ideas about the daily caloric requirements vary. Since many German Shepherds have sensitive stomachs, it may be wise to phase in the new diet by mixing it with their existing food until they have adapted. Start by mixing the diet with their existing food in equal amounts. After 1 week increase the diet to 75% of their food. After another week, switch completely over to the diet. This diet is balanced and high in most of the vitamins and minerals which your dog will need. Any shortcomings will be corrected with the supplements given below as part of the treatment.

Note: The general purpose of the diet is to provide excellent quality of ingredients with protein coming from Soybean curd (tofu). Tofu contains many valuable flavonoids and other ingredients which promote health. If you decide to use a commercial food, you may want to use a Soybean Concentrate which contains these ingredients, but lacks the extra protein. Alternatively, you can add tofu to the diet (5-6 oz/day) and add honey or molasses to it (¼ cup) to make it taste better. Reduce the commercial diet by 25-33% and

monitor your dogs weight, reducing or increasing the commercial diet accordingly. The addition of raw garlic is to provide garlic's anti-inflammatory action and (since it is raw) to provide an antibiotic action. Raw garlic is anti-bacterial and anti-fungal. This action is lost when garlic is cooked or dried. Dry ginger is also a good anti-inflammatory. Together with garlic, dry ginger can replace the need for aspirin-like (NSAID) drugs. Fresh ginger or pickled ginger are also good anti-emetic compounds, calming the stomach. Mustard provides ingredients which support improved digestion and bowel function. So, raw garlic, dry ginger (occasionally using fresh or pickled ginger) and dry mustard should be added to the food, even if it is commercial. These will not unbalance the commercial food, providing important drug properties without the side-effects of "non-natural" drugs. Using the vegetables, the diet also provides many nutrient and vitamins which are not found in commercial dog food. If commercial dog food is given, giving extra Soy Concentrate, Soy Lecithin and Beta-Carotene to the diet will improve the commercial food. They are not needed, if you feed the above diet. The diet provides a balanced, moderate protein and fat diet which is high in many essential nutrients. The only commercial food which fulfills many of the goals is *Nature's Recipe Canine Vegetarian Diet*, available from many specialty pet supply stores.

Supplements (dietary):

Vitamins:

B-Complex:

B vitamins are water soluble and any excess amount will be eliminated through the urine. They may help in neural regeneration and are something which should be given to dogs. No dog should die while having cheap urine. In DM, there is altered absorption of some B vitamins and supplementation can correct this. If your dog is healthy, then give high potency B-complex (containing approximately 50 mg of most of the B components). If your dog has DM, give stress formula B-complex containing 100 mg of most of the B components.

Yeast:

Nutritional yeast, in powder or flake form, is a good source of the B-complex vitamins, trace minerals, and some protein. It is not expensive. A heaping tablespoon of yeast will color your dog's urine yellow (owing to its content of riboflavin). You may sprinkle it on the diet, as an alternative to giving your dog a B-complex pill. However, it may be more difficult to be sure you are giving the right dose. Try 1-2 T with eat meal.

Antioxidants:

Vitamin E:

Vitamin E is an important nutrient which has been shown to have a number of physiologic and pharmacologic effects. It is a potent

antioxidant and reduces fat oxidation and increases the production of HDL cholesterol. At higher doses it also reduces cyclooxygenase and lipoxygenases activities, decreasing production of prostaglandins and leukotrienes. As such, it is a potent anti-inflammatory drug. It will reduce platelet function and prolong the bleeding time slightly in healthy individuals. There is no known side-effects to vitamin E at levels less than 4000-6000 IU per day (except in cats, where levels >400 IU/day might create hepatolipidosis). This drug slows the progression of DM and corrects for low serum and tissue levels. In DM, there does appear to be a deficient absorption and tissue-binding protein which accounts for the low serum and tissue concentrations of vitamin E. I recommend that vitamin E be given to all German Shepherd dogs. For GSD under 2 years of age, give 400 IU of vitamin E daily. For GSD over 2 years of age, give 800 IU of vitamin E daily. If your dog develops DM, then the dose of vitamin E should be increased to 2000 IU daily.

Vitamin C:

Vitamin C works with vitamin E and helps regenerate vitamin E, potentiating its antioxidant effect. Vitamin C supplementation does no harm, since the excess is excreted through the kidney. While dogs produce vitamin C in their bodies (unlike human beings, pigs and guinea pigs who must have it in their diet), under stress or disease, they may need vitamin C in excess of their manufacturing capacity. In excessive dose, vitamin C can cause flatulence and diarrhea. This intestinal tolerance level varies among dogs, but is generally around 3000 mg per day in an adult GSD. I recommend this be given to all GSD. For GSD under 2 years of age, give 250 mg vitamin C twice a day. For GSD over 2 years of age, give 500 mg of vitamin C twice a day. If your dog develops DM, then increase the vitamin C to 1000 mg twice a day unless this level causes diarrhea.

Selenium:

Selenium is an important mineral which has antioxidant properties similar to vitamin E. Vitamin E can replace the requirement for selenium in the body, but selenium cannot substitute for vitamin E. In addition, selenium does not cross the blood-brain barrier like vitamin E. On the other hand, selenium may help allow vitamin E to be more effective. Many plant sources are low in selenium and supplementation may be important. Selenium can create toxicity if given at too high a level; therefore, never give more than 200 µg of selenium per day in large dogs nor more than 100 µg per day to small dogs. Below these levels, selenium should be safe. I recommend giving selenium to GSD. For GSD under 2 years of age, give 100 µg of selenium daily. For GSD over 2 years of age, give 200 µg of selenium daily.

Membrane stabilizers:

Omega-3 fatty acids:

Omega-3 fatty acids like EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are the constituents of fish oils that act as anti-inflammatory agents and may be worth trying if your dog has an autoimmune disorder or arthritis. Many versions of these substances are on the shelves of health-food stores, from salmon oil to capsules of concentrated EPA. However, eating some cooked salmon or sardines may have benefits over capsular forms of the fish oils. Alternatively, you can give ground flax seeds, flax oil, or hemp oil as a dietary supplement; rather than fish oils. These materials will reduce platelet function for a brief period in dogs, but it seems that dogs compensate for this within about 8 weeks. Omega-3 fatty acids replace the 2-series fatty acids over time. As such, cellular stimulation produces 3-series prostaglandins and thromboxanes. The latter does not cause inflammation and reduce blood flow like the 2-series thromboxanes. I recommend all dogs receive a 1000 mg of fish oil capsule, 1 T ground flax seeds or eat 2 sardines every day.

Gammalinolenic acid:

Borage oil, evening primrose oil and black currant oil are natural sources of gammalinolenic acid, a fatty acid which is hard to get in the diet. GLA is an effective anti-inflammatory agent with none of the side effects of anti-inflammatory drugs. It also promotes healthy growth of skin, hair, and nails. It may be good for skin conditions, arthritis, and autoimmune disorders. It takes six to eight weeks to see changes after adding GLA to the diet. I recommend all dogs receive 500 mg of GLA twice a day, either as borage oil, evening primrose oil or as black currant oil.

Soybean Lecithin:

Lecithin is a fat-like substance found in the cells of the body. It may combat atherosclerosis, improve memory, and fight Alzheimer's disease in human beings. However, there is no scientific evidence to support these claims. On the other hand, lecithin is harmless. It is not necessary as a supplement unless your dog has DM and you elect not to use the diet proposed above. (There is plenty of soybean lecithin in the tofu.) If you decide to use commercial dog food, add 1-2 tsp of soybean lecithin granules to the food at each feeding.

Coenzyme Q:

Coenzyme Q also called Co-Q-10, is a natural substance that assists in oxidative metabolism. It may improve the utilization of oxygen at the cellular level, and patients with heart, muscle and nerve problems may

find it worth trying in doses of 30-100 milligrams a day. Some human beings report that it increases their aerobic endurance. Coenzyme Q is harmless, but not cheap. It is probably not worth supplementing your dog with Coenzyme Q, if it is healthy. However, since DM patients suffer from nervous system problems, muscle wasting and need aerobic endurance, I recommend giving DM patients 100 mg Coenzyme Q daily.

Tonic herbs (natural remedies):

Ginkgo leaves:

One tonic I recommend is an herbal preparation made from the leaves of the ginkgo tree (*Ginkgo biloba*). Recently extracts of ginkgo leaves have attracted much attention from researchers because of their ability to increase blood flow to the brain. You can buy capsules of these extracts in most health-food stores, although different brands vary considerably in their content of active ingredients (ginkgocides). Ginkgo is nontoxic. For DM dogs, give 1 capsule twice a day.

Ginseng: (males only)

Two species of ginseng are available: Oriental ginseng (*Panax ginseng*) and American ginseng (*Panax quinquefolium*). Both are full of compounds (ginsenosides) that work on the pituitary-adrenal axis, increasing resistance to stress and affecting metabolism, skin and muscle tone, and hormonal balance. Oriental ginseng is more of a stimulant and can raise blood pressure in some people, so I recommend using only the American species for dogs. Ginseng probably has little to offer young dogs, but may provide an increase in vitality to an older one. I recommend using 1 capsule of American ginseng once or twice a day in male dogs over 6 years of age. (Obviously, this includes male GSD who have DM!)

Dong quai: (females only)

Dong quai is a Chinese herbal remedy made from the root of *Angelica sinensis*, a large plant in the carrot family. It is often called "female ginseng," because it is a general tonic for women and the female reproductive system in much the same way that ginseng acts as a tonic for men and the male reproductive system. Dong quai is available in the form of encapsulated extracts. It is a good general remedy for female dogs who lack energy. I recommend using 1 capsule of dong quai once or twice a day for female dogs over 5 years of the age.

Green tea:

Green tea is a good general tonic and has some cholesterol lowering effects. It also contains theophylline which can help boost energy. It is

available as a capsular extract or you can make green tea and add it to the diet. I recommend 1 capsule (or cup) twice a day for DM dogs.

Grape seed extract:

A great deal of recent evidence supports the value of grape seed extract in reducing free radicals and decreasing the chances of developing chronic diseases. It is best to use standardized extracts. Alternatively, your dog can drink 1 cup of "purple" grape juice. The dose of the extract is 1 capsule (50 mg) daily for DM dogs.

Hydergine:

One prescription drug hydergine, derived from ergot (a natural fungus) may be worth trying, since it appears to help regeneration of nerve cells and fibers. It is nontoxic; however, some dogs experience GI upset and diarrhea when starting hydergine. It is probably best to start it at 2.5 mg three times a day for 2 weeks. If no problems are seen, then increase to the dose of 5 mg every 8 hours. Unfortunately, it is expensive, since you will have to give high doses for months or years; cheaper generic forms are available from [Westlab Pharmacy](#) (1-800-4WESTLA). For dogs with advanced DM, give 5 mg three times a day for at least three months. I only recommend this for dogs with advanced DM, since it can cause GI upset, holding it in reserve until truly needed. Your veterinarian will have to prescribe it for you.

Siberian Ginseng:

Siberian ginseng is derived from the root of a large, spiny shrub (*Eleutherococcus senticosus*) found in Siberia and northern China. It is a relative of true ginseng, but has entirely different properties. Siberian ginseng has "adaptogenic" properties and reduces physiologic responses to stress. Scientific investigations suggest it increases physical performance and endurance and improves immune function. For dogs with DM, give 1 capsule twice a day.

Bromelain/Curcumin:

Bromelain is an extract of pineapple stems which has the property of decreasing circulating immune-complexes. As such, there is no Western medicine which is its equal. Since many of the complications and the direct initiation of the immune damage may be caused by the elevated immune-complexes in DM, bromelain may be an important key in helping to control the progression of DM. Curcumin (the yellow pigment of turmeric plants) is a potent anti-inflammatory agent. Bromelain and curcumin have a synergistic effect whereby they assist the absorption of

each other from the gastrointestinal tract, increasing their potency. As such, they should be given together. Many health food stores carry combinations of bromelain and curcumin. For dogs with DM, give 400-500 mg of bromelain with 500-400 mg of curcumin twice a day. (Curcumin is found in low concentrations in the spices turmeric and yellow mustard. As such, it is possible to replace the "capsule" form by adding 1-2 Tbs of turmeric and 1-2 tsp of dry yellow mustard to the diet.)

Feverfew:

Feverfew is a natural NSAID compound without the side-effects of prescription drugs. It can be used in dogs with pain or arthritis to help reduce inflammation and discomfort. I do not recommend it for routine use; but, if your dog has pain from arthritis, give 1 capsule every 8-12 hours as needed. You can use this for 5 days out of the week, safely.

Note: [WestLab Pharmacy](#) has developed a palatable vitamin/mineral/herb product (Antiox-Q) which contains bovine cartilage, coenzyme Q, vitamin E, GLA, omega fatty acids, selenium, ginkgo, bromelain, curcumin, olive oil and B complex. This product contains the correct dosage of these compounds and only needs the addition of vitamin C, the ginsengs, green tea and grape seed to be complete. They may be contacted at 1-(800)-4WESTLA [1-(352)-373-8111, locally].

Medication:

Over the last 2 decades, we have found 2 medications which appear to prevent progression or result in clinical remission of DM in many (up to 80%) of the patients. These medications are aminocaproic acid (EACA) and n-acetylcysteine (NAC). We recommend giving EACA as a solution, using the generic product. This product, while designed for injection, can be mixed with chicken broth to provide a palatable solution for oral usage. We mix 2 parts of aminocaproic acid solution (250 mg/ml) with 1 part chicken broth and give 3 ml of this mixture orally every 8 hours. In our experience, this mixture has been equally, if not more, effective to the tablet form of EACA. Besides, the solution is much less expensive than the tablets. The generic form of EACA solution can be obtained from American Regent, 1-(800) 645-1706 (outside of NY). The generic drug from American Regent may be obtained through prescription with the help from a local pharmacy. An alternative source for EACA is to have a compounding pharmacy make the solution from chemical grade EACA. One such pharmacy is [WestLab Pharmacy](#) in Gainesville, FL. They can be reached at 1-(800) 4WESTLA [1-(352) 373-8111, locally] and can mail the medication and bill the client directly. The only side effects that have been attributed to EACA have been occasional gastrointestinal irritation. This presents a problem only in a few patients, usually who have pre-existing GI problems that the medication might exaggerate. A local pharmacist can help in determining whether any additional drugs might be contra-indicated or lead to possible drug-interactions with the

recommended therapy. The only known interaction is with estrogen compounds; but, only in high doses.

Acetylcysteine is a potent anti-oxidant which has powerful neuroprotective effects. We give 75 mg/kg divided in 3 doses a day for 2 weeks. Then, we give the 3 doses every other day. The N-acetylcysteine comes as a 20% solution and must be diluted with chicken broth (or other compatible substitute) to 5%. Otherwise, it will cause stomach upset. This new treatment is expensive unless purchased through compounding pharmacies. Again, [WestLab Pharmacy](#) has this product and can send it to clients upon veterinary prescription. Using N-acetylcysteine at the above dosing does not appear to have side-effects. It can produce vomiting and may increase the bleeding time. The GI upset is likely due to the sodium content of the pharmaceutical product, which requires high concentration of base to buffer to pH 7.4. By reducing the pH during preparation, WestLab's product does not have as many side-effects. Giving fresh ginger 30 minutes before and giving the NAC with food (or on a full stomach) often reduces this effect.

The combination of aminocaproic acid, N-acetylcysteine, dietary supplements and exercise is the best treatment we have been able to discover to date. It corrects those aspects of the immune dysfunction which we can treat, based upon our belief that DM is an immune-mediated inflammatory disease. We always hope that all patients will respond to our treatment protocol. Unfortunately, it does not work in all cases; however, this combined treatment has been up to 80% effective in patients diagnosed at the University of Florida. The chances of successful treatment are improved if the therapy is begun early in the course of DM rather than later. A response to the drugs should be evident within the first 7-10 days. There are no other medications that we have found to provide any real benefits in the long term treatment of DM. Further information about other treatments may be found in Current Therapy X, pages 830-833 and in Vet. Clin. Nor. Am. 22:965-971, 1992.

Other Supportive Measures:

Heartworm medication:

Since the monthly heartworm medications (Heartgard, Heartgard plus and Interceptor) increase immune responsiveness, we do not recommend using these products. Instead, we recommend plain diethylcarbamazine (DEC or Filaribits) which must be given daily. I do not recommend Filaribits plus (some dogs experience liver problems using it). If your dog is currently taking a monthly heartworm preventative, you must give one last dose and start the daily medication the next day. This is because the medications work at different points in the heartworm "life-cycle". Revolution, which is a new topical heartworm preventative, does not alter the immune response like the other monthly products. As such, Revolution should be safe to use in DM to control internal (and external) parasites.

Flea prevention:

Many of the old and new flea products can cause problems when certain neurologic conditions are present. As such, we recommend using boron, pyrethrums and Precor as the main control methods. Of the new medications, Frontline Spray and Revolution may be safe to use.

Acupuncture:

The traditional Chinese art of insertion of needles into various specific points of the body (with injection of small amounts of fluid or electrical stimulation) has been shown to provide analgesia and relief from acute and chronic pain. This has the advantage of having none of the side-effects of analgesic drugs. In addition, acupuncture can do no harm. In DM, acupuncture alone slows the condition, but does not stop the progress. On the other hand, DM patients who have concurrent arthritis may benefit from acupuncture therapy.

Dietary Cartilage:

In many cases of degenerative joint disease with arthritis, recent studies have suggested that glycosaminoglycans and chondroitin sulfate may help reduce pain and inflammation from osteoarthritis, assisting in the healing process. While these products are available through health-food stores or a pharmaceutical medication through your veterinarian, you can give these to your dog directly by giving cooked cartilage. Sources of dietary cartilage would include cooked and "de-bone" chicken wings or using cooked spare ribs as the meat source in the diet. Why pay for cartilage products if it can be gotten for free in the dietary source. Some people taught the benefits of shark cartilage, but there are no scientific studies to support these claims. (It is also ecologically unsound to kill sharks to harvest their cartilage.) On the other hand, increasing dietary cartilage can do no harm, particularly in the face of arthritis. In DM patients with arthritis, I recommend 1-2 grams of dietary cartilage with each meal. Another alternative is bovine gelatin (Knox gelatin or Knox Nutrajoint) which can be added to the food (1-2 packages per feeding). In some dogs, using glucosamine/chondroitin sulfate complex will be beneficial in controlling joint pain and stimulating healing; however, dietary cartilage has these compounds along with other important ingredients. Forms of glucosamine/chondroitin sulfate complex are available at health food store. (These are cheaper than products available from your veterinarian and may work as well) I recommend around 1200 mg of glucosamine and 1500 mg of chondroitin sulfate daily, if other forms of cartilage are not available.

Stress Reduction:

DM progresses at different rates and "stress" plays a role in its advancement. Minimizing stressful situations is important where possible. While anesthesia does not appear to cause problems with DM; in the past, even minor invasive surgical procedures can result in a marked increase in clinical signs of DM. Unfortunately, the worsening caused by surgical stress can be irreversible. Due to the advent of N-acetylcysteine therapy and being more attentive to the continued exercise of hospitalized DM patients, we now have been successful in performing many surgical procedures in these dogs. These have

included cervical and thoracolumbar disc surgery and total hip replacement. Before aggressive surgeries are considered, it is best to determine that the patient's neurologic status is stable. Post-operative physical therapy remains crucial in getting patients on their feet quickly.

Note: If your dog already has DM, you should consider treatment with the above natural products and more traditional aminocaproic acid and acetylcysteine medications. Use the aminocaproic acid and acetylcysteine for the first 2 months of therapy and then see if they can be withdrawn (without signs of deterioration). If so, then continue with the natural approach from that point on.

The Future for DM:

The key to DM in the future is likely to be prevention. While it may be necessary to wait for the next generation of GSD to see whether the principles laid down here work, they can do no harm. Science is only beginning to understand the fragile nature of DNA and how natural healing can be hampered by dietary and environmental toxins. The body is endowed with a tremendous capacity to heal, if we do nothing to interfere with this process. We are the keepers of our pet's health. We must empower ourselves to accept this responsibility. Conventional medicine falls short in the treatment of DM, leading to the need to pursue other forms of treatment. For more information about the positive aspects of spontaneous healing, read the book by Andrew Weil, MD: *Spontaneous Healing*, Ballantine Books, New York, 1995.

Disclaimer: The information presented here is for educational usage. It is not an endorsement of any particular product. You will need to discuss the measures and natural alternatives with your veterinarian. If the problem worsens or new signs develop, discontinue medication and seek appropriate veterinary medical care. This material represents the views of the author and does not necessarily reflect the views or policies of the VMTH or the University of Florida.
